Conclusion

Computer Graphics and Imaging
UC Berkeley CS184
Summer 2020

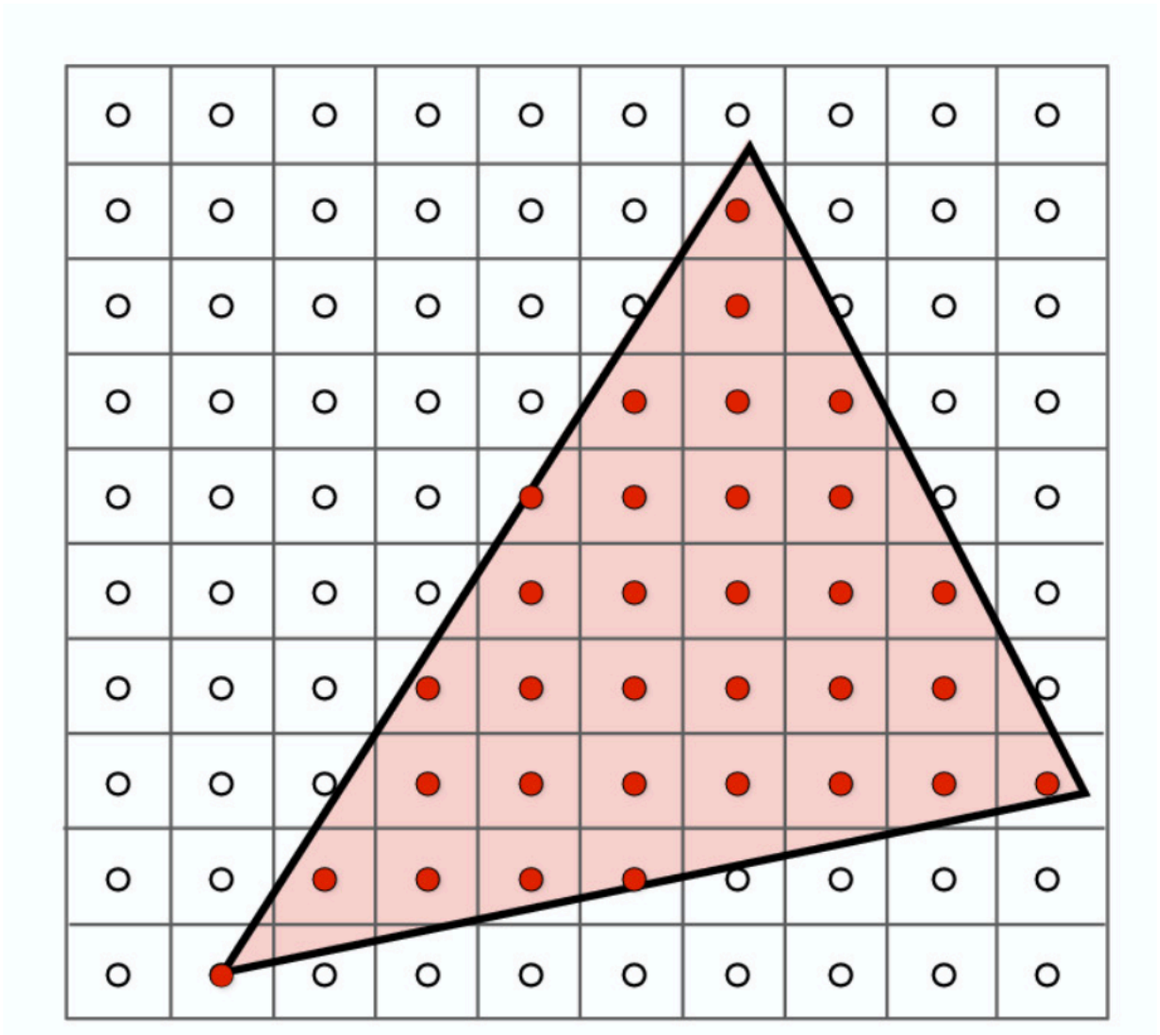
Agenda

- Course Content Recap
  - What do you know?
- Skills
  - What can you do?
- What’s next?

First and Foremost, Congratulations!!!

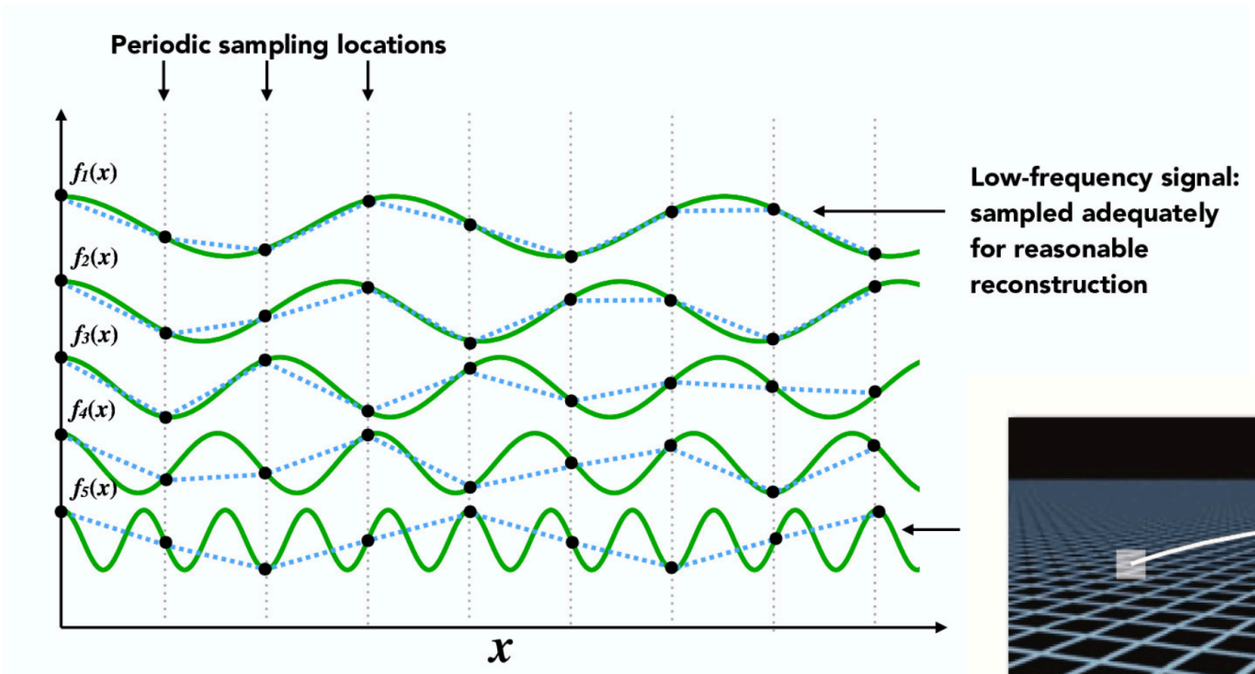
Rasterization

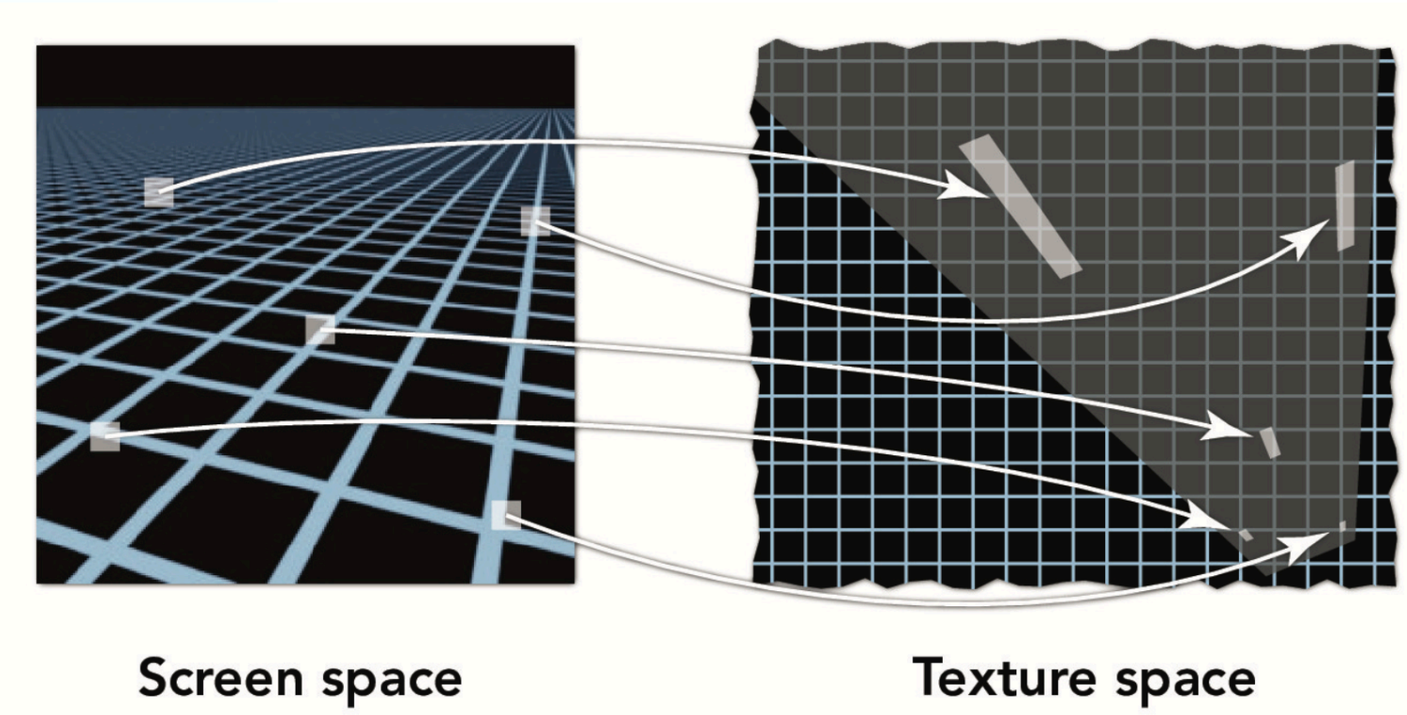
- How do triangles (or images in general) get drawn to a screen?



Sampling and Filtering

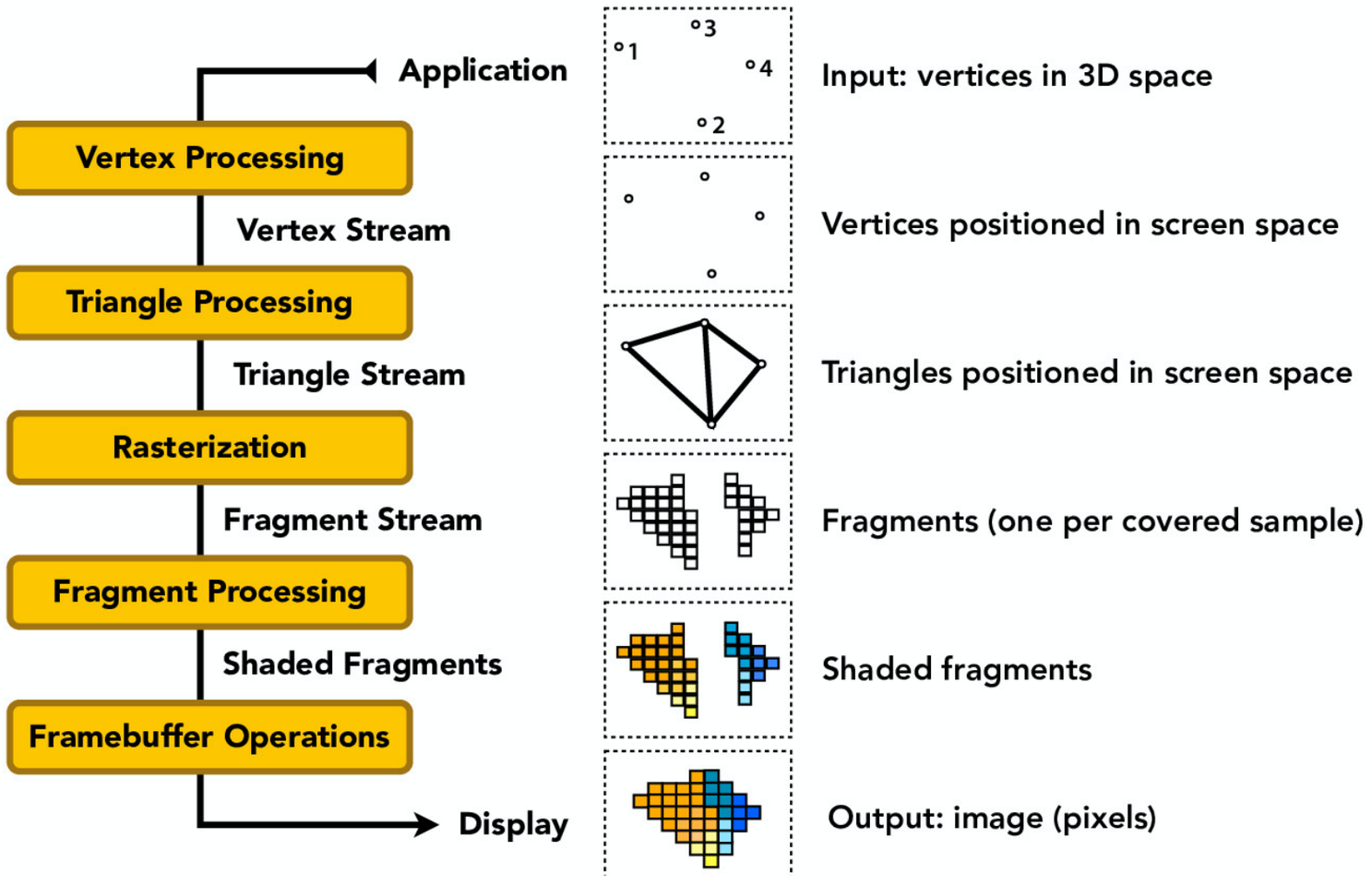
- What are some sampling “best practices”?





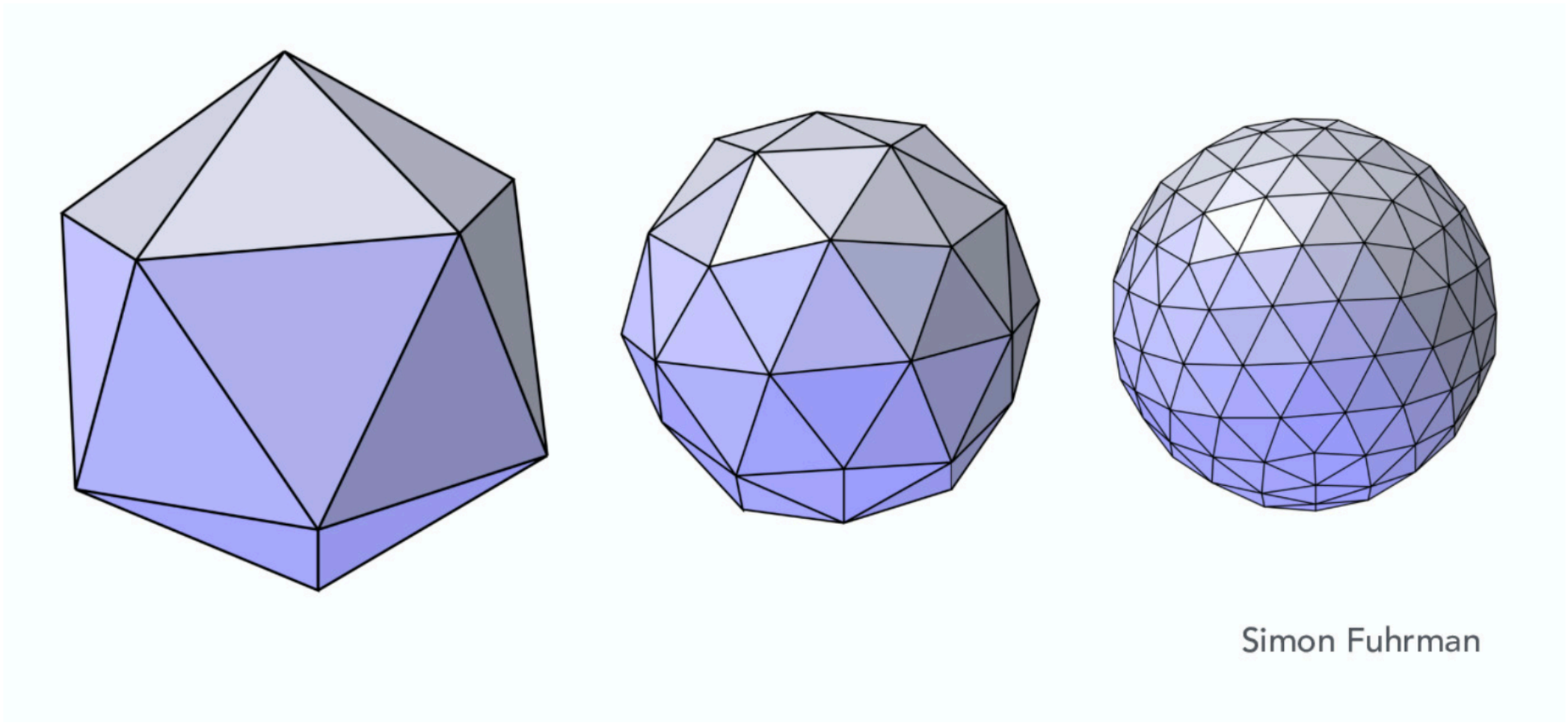
Graphics Pipeline

- How do we go from a set of vertices to a fully shaded image?



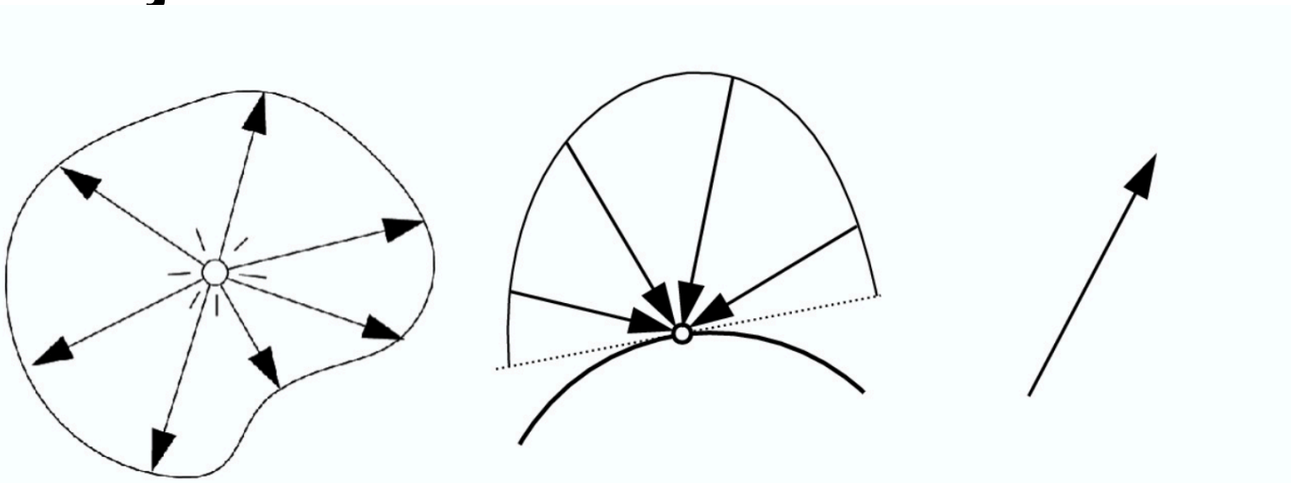
Geometric Modeling

- How do we define and modify 3D shapes?



Lighting and Materials

- How do we represent material properties of 3D objects?



Light Emitted From A Source

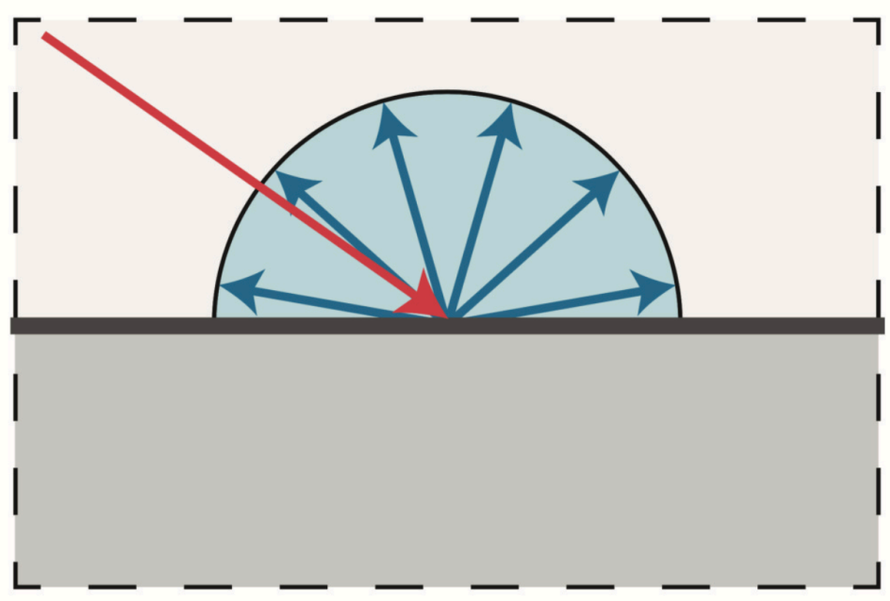
"Radiant Intensity"

Light Falling On A Surface

"Irradiance"

Light Traveling Along A Ray

"Radiance"

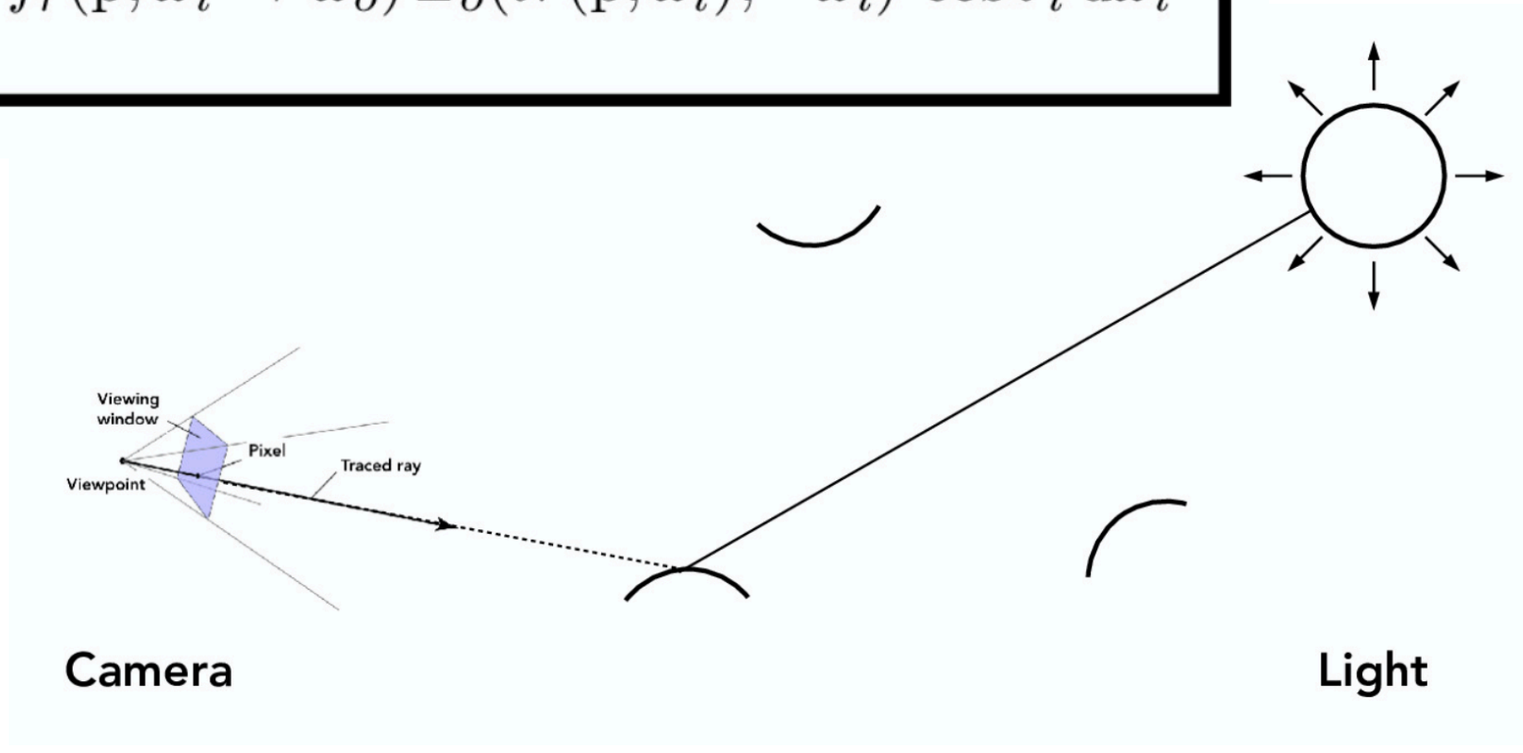


Light Transport

- How do we simulate the way light works in the real world?

The Rendering Equation

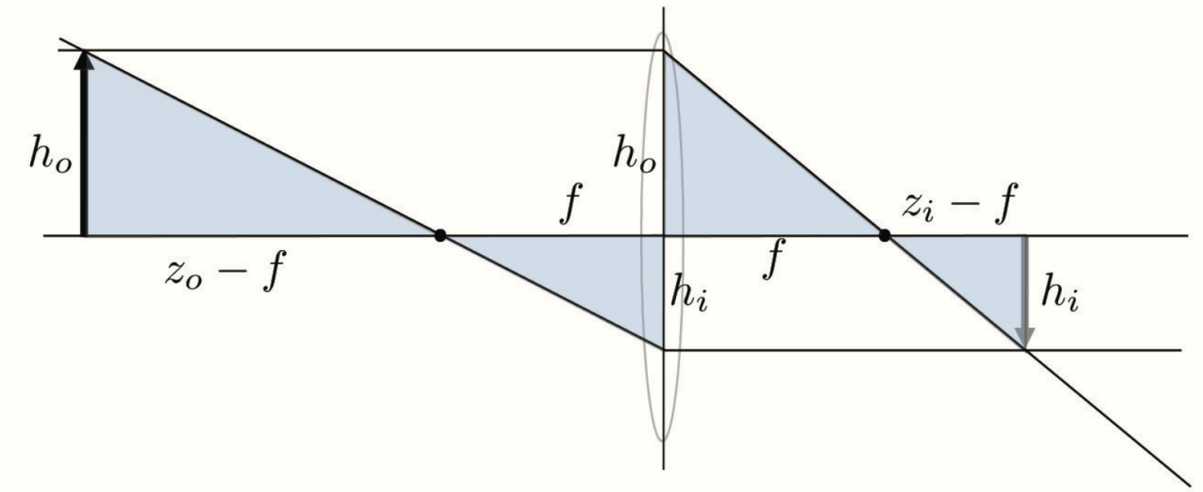
$$L_o(\mathrm{p}, \omega_o) = L_e(\mathrm{p}, \omega_o) + \int_{H^2} f_r(\mathrm{p}, \omega_i \to \omega_o)\, L_o(tr(\mathrm{p}, \omega_i), -\omega_i)\, \cos\theta_i \, \mathrm{d}\omega_i$$



Cameras and Imaging

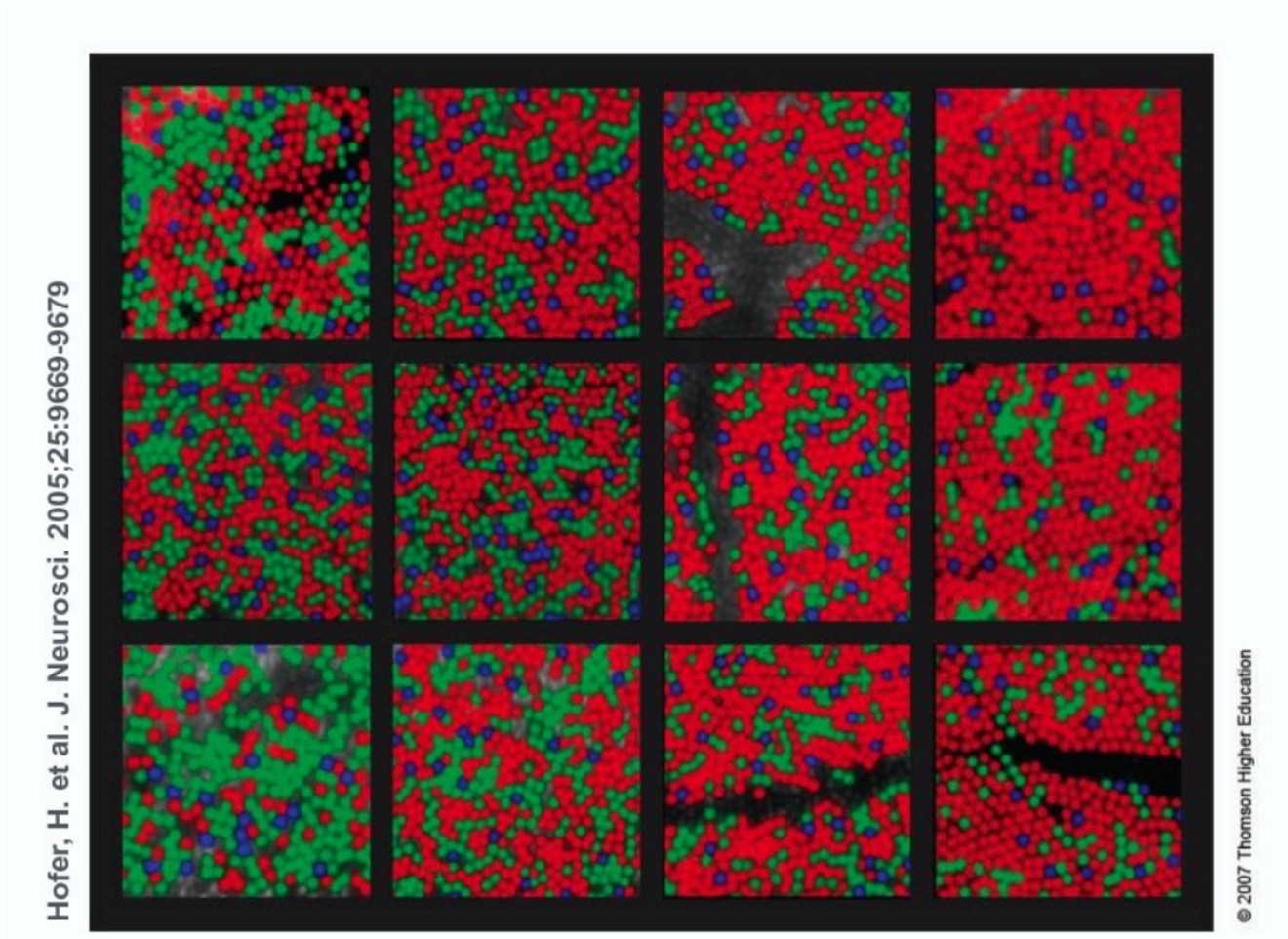
- How do cameras work? How do you adjust different camera parameters to get different effects?

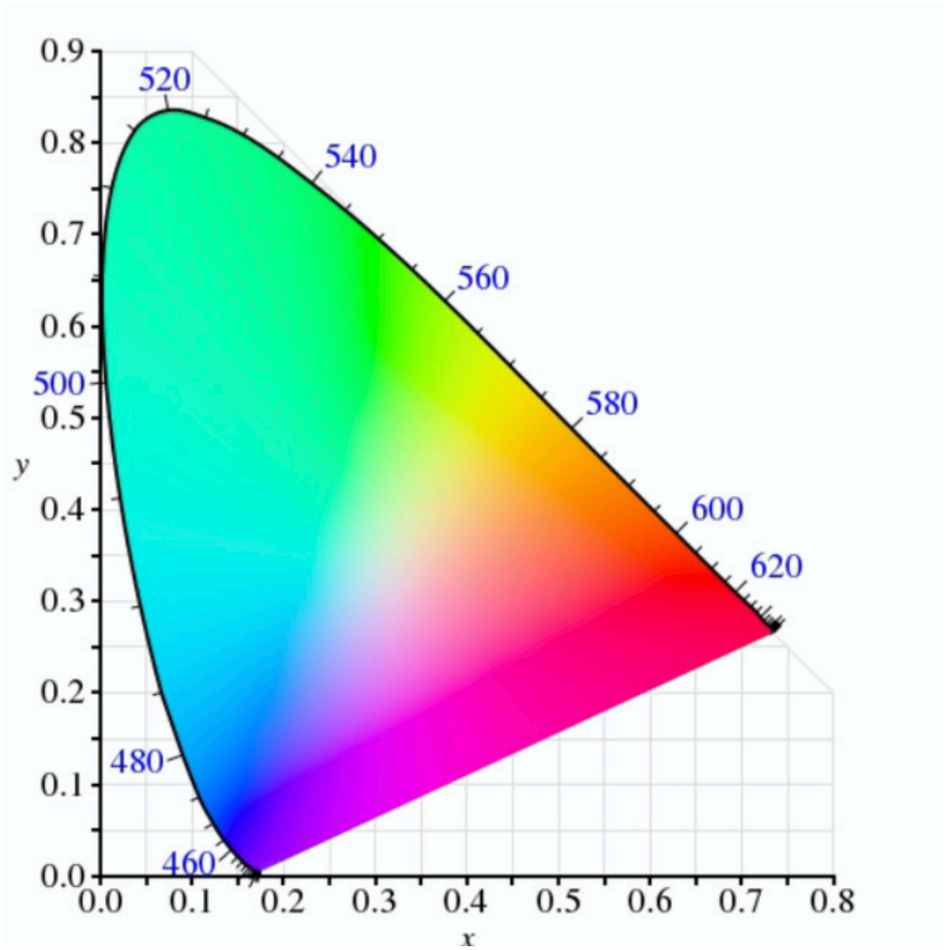
From Canon EF Lens Work III



Color

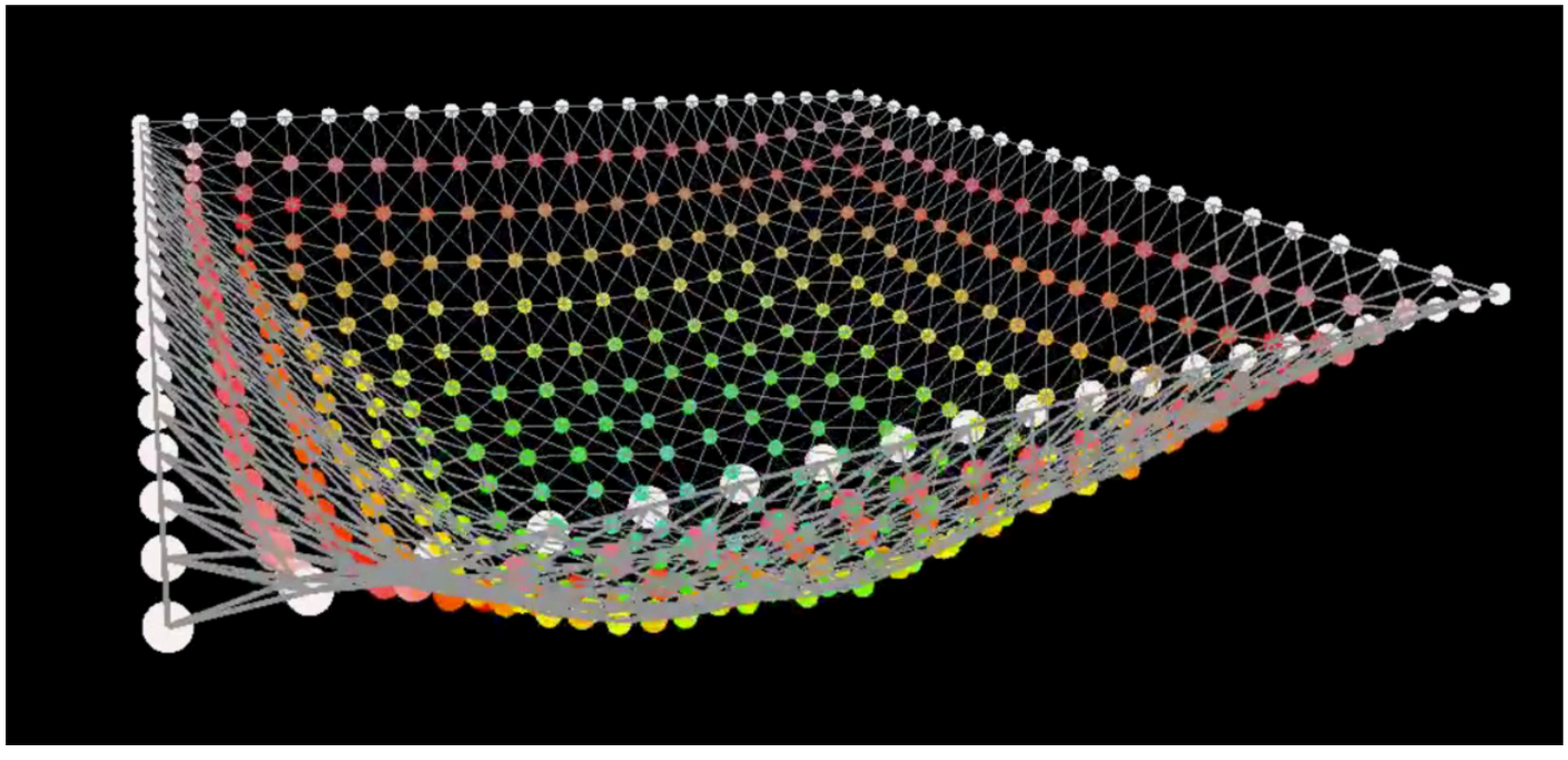
- How do we see color? How do machines represent color?





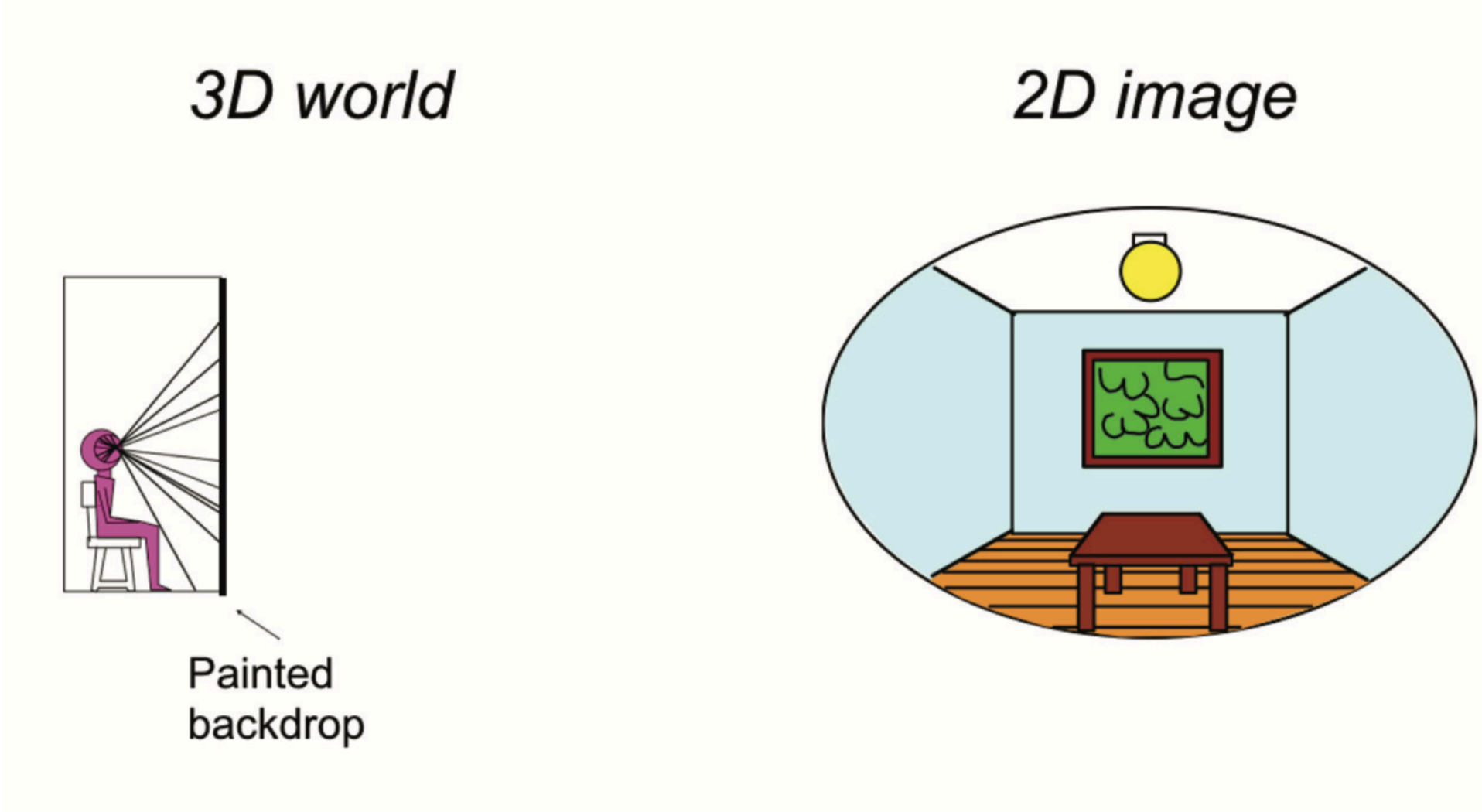
Animation and Simulation

- How do we model the movement of particles/particle systems?



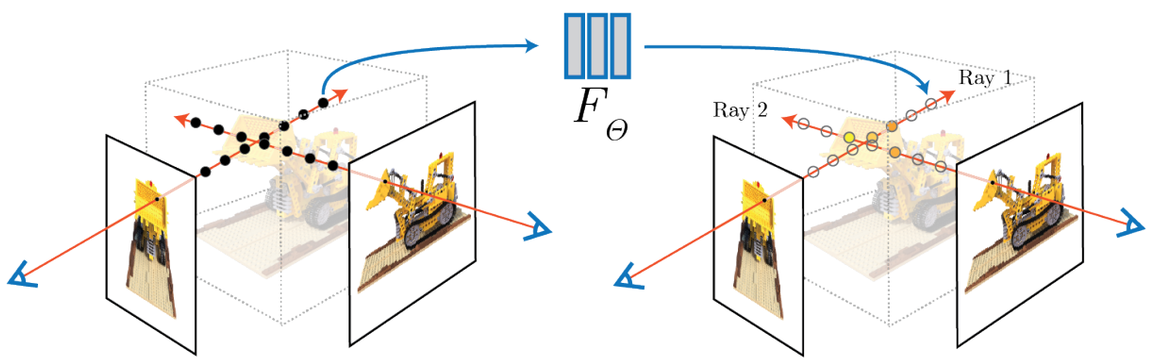
Virtual Reality

- How do we simulate new worlds and deliver them directly to your eyes?



Graphics + X

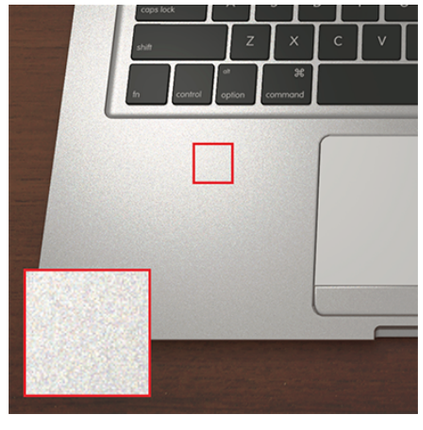
- What's going on in graphics these days?



Input

3 examples of relit images under different lighting environment

Sun et al. "Single Image Portrait Relighting" SIGGRAPH 2019



What can you do now?

- Develop on pretty large and complex C++ programs!
- Write shader code
- Propose and work on an fairly open-ended project
- Write detailed but clear and concise technical explanations of work you have done
- Extend mathematical building blocks (i.e. similar triangles, line equations, etc.) into more complex concepts (i.e. camera lens diagrams, signed distance functions)
- Extend graphics building blocks into more complicated advanced/ complex models
    - i.e. fancy BRDFs, everything is sampling, transformation matrices, physical simulations

So, What's Next?

Other Courses in Visual Computing

- EE118 — Intro to Optical Engineering
- CS194-126 — Computational Photography
- CS274 — Computational Geometry
- CS 284B — Advanced Computer Graphics
- CS280 — Computer Vision
- EE 290 — Computational Imaging
- Special Topics
  - CS294-164 — Computational Color (Ren's class!)
  - CS294-173 — Seminar: 3D Vision
  - CS 294-137 — Theory and Applications of VR & Immersive Computing
- DeCals
  - Game Design + Development
  - UCBUGG (3D Modeling and Animation)
  - Virtual Reality

Research

- Particularly if you found the Color portions of the course interesting, talk to Ren!
- The three of us will be graduating :(But you may want to check out what Ren’s remaining students are doing!
- Otherwise, may want to look at faculty in Computer Vision, Robotics, HCI

Industrial Opportunities

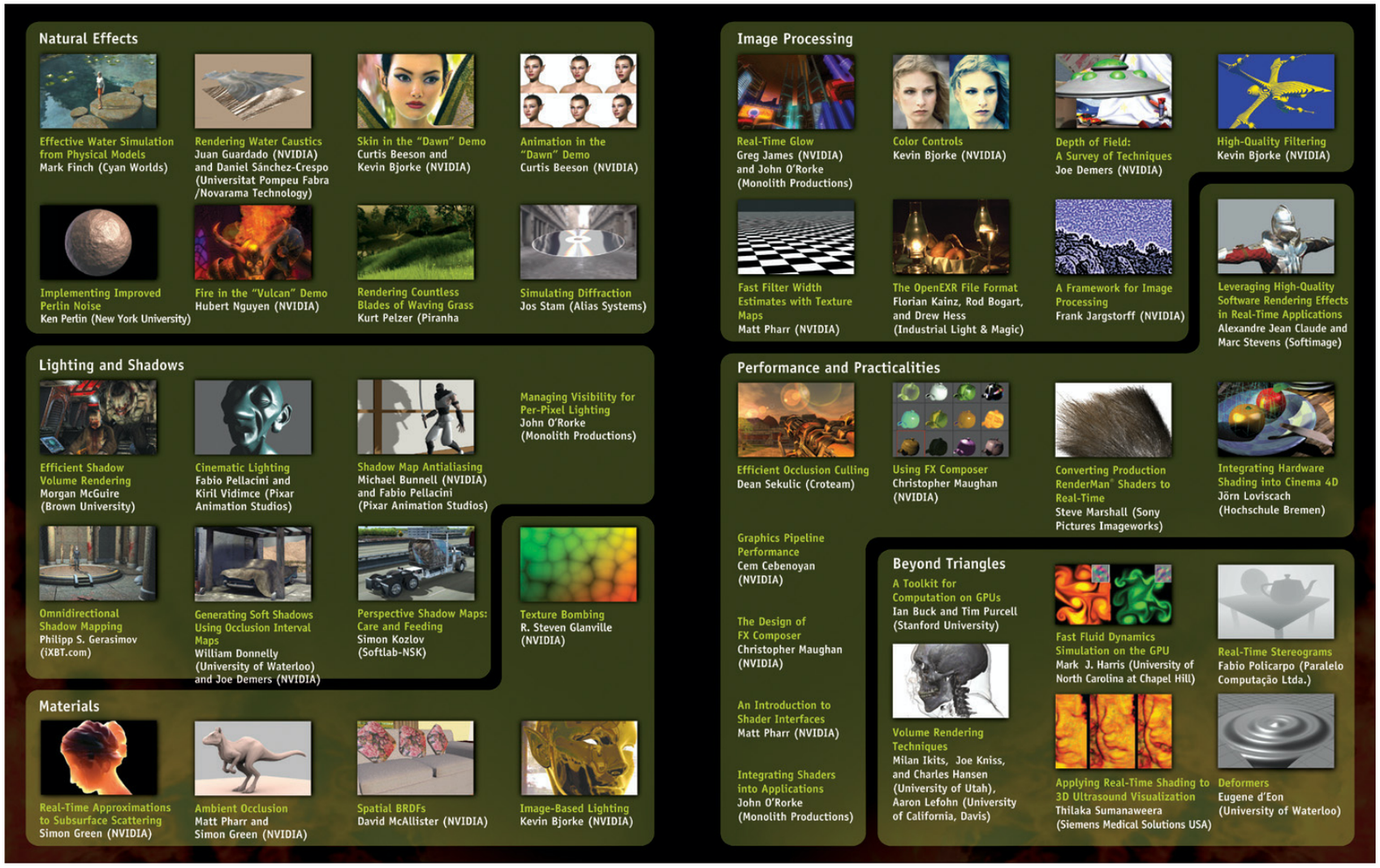
- NVIDIA
  - rendering, GPUs, AI, self driving, gaming
- Adobe
  - image processing, comp photography
- General industries: gaming, animation, image/video processing
- Startups

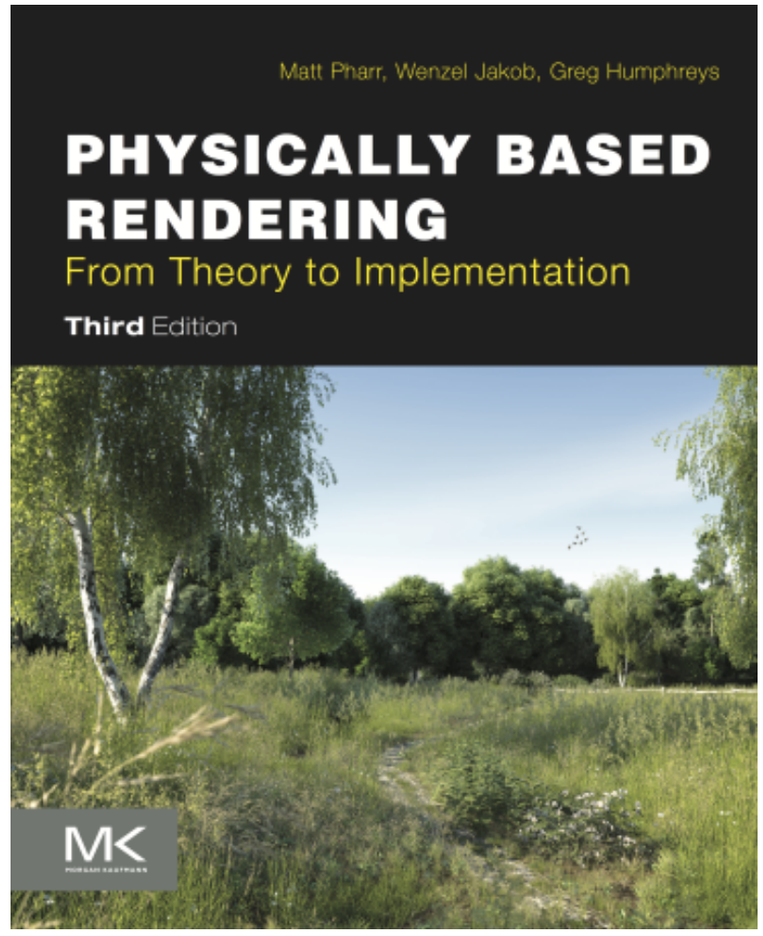
Teach 184!

- Official department applications for TAing are usually released early-mid semester (though they get earlier every year)
- If you're passionate about teaching, we encourage you to apply!

Continue exploring!

NVIDIA GPU Gems





Thanks for Joining Us This Summer!